INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	**:**	**Fundamentals of HVDC and FACTS devices**
Course Code	**:**	**A80237**
Class	**:**	**IV B.Tech II Semester**
Branch	**:**	**Electrical and Electronics Engineering**
Year	**:**	**2018 - 2019**
Course Coordinator	**:**	**Ms. B Manogna, Assistant Professor, EEE**
Course Faculty	**:**	**Ms. B Manogna, Assistant Professor, EEE**

OBJECTIVE:

This subject deals with the importance of HVDC transmission, analysis of HVDC converters, Faults and Protections, Harmonic and Filters. It also deals with Reactive power control and Power factor improvements of the system

ASSIGNMENT - I			
UNIT - I			
S.No	**Question**	**Blooms Taxonomy Level**	**Course Outcome**
1	List out the applications of HVDC?	Understand	1
2	What are the types of transmission system?	Remember	1
3	State the comparison of AC & DC transmission system?	Remember	1
4	State the disadvantage in dc transmission?	Understand	1
5	State the advantages in DC transmission?	Remember	1
6	What are the types of DC link?	Understand	1
7	Name the HVDC transmission in India?	Understand	1
8	What are the limitations of EHVAC transmission?	Remember	1
9	What are the types of dc links?	Understand	1
10	Draw the cost vs distance curve of ac and dc transmission?	Understand	1
11	Define pulse number?	Remember	1
12	Draw the diagram Graetz bridge circuit	Understand	1

13	Write the equation of ac current and dc voltage harmonics	Remember	1
14	What is choice of converter configuration?	Remember	1
15	Define peak inverse voltage?	Remember	1
16	Draw the schematic diagram of three & two valve conduction mode	Understand	1
17	Define twelve pulse converter with schematic diagram	Remember	1
18	What is meant by neglecting overlap in gratez in bridge circuit	Remember	1
19	What is commutation voltage of valves?	Understand	1
20	What are the assumptions made to simplify the analysis of Gratez circuit?	Remember	1
DISCRIPTIVE ANSWER QUESTIONS			
1	What are the different applications of dc transmission system? Explain them in detail?	Remember	1
2	With neat sketches explain the different kinds of dc link available?	Remember	1
3	Explain the comparison of AC and DC transmission in detail	Understand	1
4	Explain in detail about the planning of HVDC transmission?	Remember	1
5	Explain the technological development of modern trends in dc transmission	Remember	1
6	Explain the major components of HVDC transmission in converter station unit?	Understand	1
7	State the advantages and disadvantages of dc transmission system with following economics, reliability, and performance.	Understand	1
8	Draw a typical HVDC layout and explain their basic components?	Remember	1
9	Explain the modern trends in dc transmission?	Understand	1
10	Explain the application of HVDC c transmission system?	Remember	1
11	Draw the schematic circuit diagram of a 6 pulse gratez circuit and explain its principle of operation.	Understand	1
12	Explain the individual characteristics of a rectifier and an inverter with sketch	Understand	1
13	Derive the expression for input power, output power and power factor of 12-pulse bridge converter with delay angle α. Assume there is no overlap.	Understand	1
14	Explain the effect of overlap angle on the performance of converter circuit.	Understand	1
15	Explain the choice of converter configuration for any pulse number.	Remember	1
16	Explain the analysis of 12 pulse converter with bridge rectifier.	Remember	1
17	Give the typical converter transformer rating for a HVDC transmission system?	Understand	1
18	Explain the term angle of advance and its significance in inverter control	Remember	1
19	What are the different types of modes of operation of rectifier?	Understand	1
20	Write down the average dc voltage of Graetz circuit without overlap?	Understand	1

UNIT - II			
SHORT ANSWER TYPE QUESTIONS			
1	What will be the current regulation in inverter side?	Understand	2
2	Define firing angle control.	Understand	2
3	What is un compounded inverter?	Understand	2
4	Draw the characteristics curve for inverter compounding?	Remember	2
5	Write down the converter bridge characteristics?	Understand	2
6	Explain overlap angle and extinction angle.	Understand	2
7	Discuss in detail the effect of source inductance on hvdc system	Remember	2
8	Explain the individual characteristics of a rectifier and an inverter with sketches.	Understand	2
9	Explain current and extinction angle control.	Understand	2
10	Draw and explain the inverter and rectifier compounding characteristics with constant voltage and current curve.	Understand	2
DISCRIPTIVE ANSWER QUESTIONS			
1	Explain firing angle control & current and extinction angle control.	Understand	2
2	Explain overlap angle and extinction angle.	Remember	2
3	Define the term angle of advance and its significance in inverter control.	Remember	2
4	Explain the individual characteristics of a rectifier and an inverter with sketches.	Remember	2
5	Discuss in detail about the transformer tap changer with its types.	Understand	2
6	Discuss in detail about the converter control characteristics of HVDC system.	Understand	2
7	Discuss in detail the principle of DC Link control.	Remember	2
8	Explain the system control hierarchy.	Remember	2
9	Explain the un compounded inverter with neat sketches.	Understand	2
10	Why the delay angle and extinction angles are to be maintained to minimum value.	Understand	2
UNIT - III			
SHORT ANSWER TYPE QUESTIONS			
1	Write the different types of AC/DC power flow.	Remember	3
2	What is unified method of DC power flow?	Understand	3
3	What is sequential method of DC power flow?	Remember	3
4	What are the advantages of variable elimination method over extended variable method?	Understand	3
5	Draw the DC system model.	Remember	3
6	Draw the norton’s equivalent circuit for a converter.	Remember	3

7	What are the additional constraints needed to include for ac-dc power flow?	Remember	3
8	List some essentials of power flow analysis.	Remember	3
9	Compare sequential and simultaneous methods of ac-dc power flow.	Remember	3
10	What are the major steps in the power flow analysis of MTDC-AC Systems?	Understand	3
11	Define Harmonic.	Understand	3
12	How harmonics are generated?	Understand	3
13	Mention the various sources of harmonic generation in HVDC system.	Remember	3
14	What are other methods of eliminating harmonics with HVDC system.	Remember	3
15	Write the different types of AC/DC power flow.	Understand	3
16	What is unified method of DC power flow?	Understand	3
17	What is sequential method of DC power flow?	Remember	3
18	What are the advantages of variable elimination method over extended variable method?	Understand	3
19	Draw the DC system model.	Remember	3
20	Draw the norton's equivalent circuit for a converter.	Remember	3
21	What are the additional constraints needed to included for ac-dc power flow?	Remember	3
22	List some essentials of power flow analysis.	Understand	3
23	Compare sequential and simultaneous methods of ac-dc power flow.	Remember	3
24	What are the major steps in the power flow analysis of MTDC-AC Systems?	Remember	3
25	Define AC filter?	Remember	3
26	Define DC Filter?	Understand	3
27	What are the components present in AC & DC filter?	Remember	3
28	What are the types of AC filters & DC?	Understand	3
29	Define single tuned filter?	Remember	3
30	How will protect the filter?	Remember	3
ASSIGNMENT II			
UNIT - III			
1	Discuss the various sources of reactive power for HVDC converters.	Understand	3
2	What is the reactive power requirement in steady state	Remember	3
3	Discuss conventional control strategies.	Understand	3
4	Discuss alternate control strategies.	Understand	3
5	Write the operation of synchronous condensers.	Remember	3
6	Explain extended variable method of DC power flow.	Remember	3

7	Explain the variable elimination method of DC power flow.	Remember	3
8	Explain the sequential method of DC power flow. Draw the necessary flow chart.	Understand	3
9	Explain about per unit system for DC quantities.	Remember	3
10	Compare sequential and unified methods of DC power flow.	Understand	3
11	Explain unified method of DC power flow.	Understand	3
12	What are the additional constraints needed to include for ac-dc power flow?	Remember	3
13	Compare sequential and simultaneous methods of ac-dc power flow.	Understand	3
13	Write a short note on the following: (a) Harmonic distortion (b) telephone Influence factor	Understand	3
14	Mention the various sources of harmonic generation in HVDC systems and suggest methods to eliminate them.	Remember	3
15	Define telephone interference Factor and Explain how it varies with harmonic order.	Understand	3
16	What are the order of harmonics present on the AC side of the VSC converter DC systems	Remember	3
17	What are the filter configurations that are employed for HVDC Converter station? Give design aspect of one such filter	Understand	3
18	Derive an equation for harmonic voltage and current for single tuned filter and discuss the influence of network admittance.	Understand	3
19	Give a detailed account of design aspects of following filters. (a) Single tuned filter (b)Double tuned filter	Remember	3
20	What are the different types of filters used on the AC side of an HVDC system? How are they located and arranged?	Understand	3
18	Give a detailed account of design aspects of following filters. (a) Single tuned filter (b)Double tuned filter	Understand	3
19	What are the other methods of eliminating or suppressing harmonics with HVDC system? Give a comparison using passive filter network	Remember	3
UNIT - 1V			
SHORT ANSWER TYPE QUESTIONS			
1	Why there is a need of interconnection in electrical power systems?	Remember	4
2	What are the problems with interconnected power systems?	Understand	4
3	Why there is need of compensation in power systems?	Remember	4
4	What are the conventional methods used for compensation in power systems?	Understand	4
5	Explain how power flows & types of powers in ac systems?	Remember	4
6	How power flow takes place in parallel electrical systems?	Remember	4
7	What are the different methods to control how of power in a parallel path in electrical power systems?	Understand	4

8	How amount of power flow can be controlled in a mesh connected ac power system?	Remember	4
9	What are the objectives of shunt compensation?	Understand	4
10	How shunt compensation is classified? Explain in detail.	Understand	4
DISCRIPTIVE ANSWER QUESTIONS			
1	The operation of STATCOM is based on the operation of syn. m/c as rotating syn.	Understand	4
2	Explain the working principle & V – I char. Of STATCOM?	Remember	4
3	Draw control schemer of STATCOM & explain?	Remember	4
4	What are the different types of losses in STATCOM?	Remember	4
5	Why there is need of hybrid VAR generators?	Remember	4
6	Explain the comparison between different types of SVC's.	Understand	4
7	Explain the operation of the SVC (FC+TCR) and derive the equations used. Also explain how the SVC is able to regulate the HVAC bus voltage.	Remember	4
8	Explain the principle of operation of STATCOM. Show that the steady state stability margin can be enhanced.	Understand	4
9	Compare STATCOM with SVC.	Understand	4
UNIT – V			
SHORT ANSWER TYPE QUESTIONS			
1	Explain the basic operating principle of an UPFC.	Understand	5
2	Explain how a UPFC is different than a simple VSC.	Remember	5
3	How an UPFC scheme can be implemented using two back to back voltage source converters.	Remember	5
4	Give the block diagram for a basic UPFC control scheme.	Understand	5
5	Differentiate clearly between an UPFC & IPFC.	Remember	5
6	Give a basic two-converter scheme for IPFC.	Understand	5
7	Explain how the control of a basic IPFC is achieved.	Understand	5
8	What do you mean by a generalized FACTS controller?	Remember	5
9	Give the block diagram for a generalize IPFC.	Understand	5
10	Draw the VI Characteristics of SSSC.	Understand	5
DISCRIPTIVE ANSWER QUESTIONS			
1	Give the functional control scheme for a SSSC	Understand	5
2	Explain what you mean by Variable Impedance type and Switching Converter type FACTS devices.	Remember	5
3	Draw V-I Characteristics and loss characteristics for: i) GCSC ii) TCSC iii) SSSC	Remember	5

4	Explain what you mean by Variable Impedance type and Switching Converter type FACTS devices.	Remember	5
5	How voltage stability at load bus can be achieved using series compensation.	Remember	5
6	How series FACTS devices respond to the problem of Sub synchronous reactance.	Remember	5
7	With the help of power angle curve explain how transient stability is improved with the help of series controllers.	Understand	5
8	Draw the compensating voltage v/s line current characteristics of TCSC & SSSC.	Remember	5
9	Explain with a neat sketch and waveforms the TCSC type of series controller.	Understand	5
10	Explain with a neat sketch and waveforms the SSSC type of series controller.	Understand	5
11	Explain how real and reactive power flow control is achieved using phase angle regulators.	Remember	5

Prepared by:
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